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EPA Superfund
Record of Decision:

FCX, INC. (WASHINGTON PLANT)
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WASHINGTON, NC
12/18/1996

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RECORD OF DECISION
FCX WASHINGTON SUPERFUND SITE
BEAUFORT COUNTY, NORTH CAROLINA
OPERABLE UNIT 2

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DECLARATION FOR THE RECORD OF DECISION

SITE NAME AND LOCATION

FCX WASHINGTON SITE WASHINGTON,
BEAUFORT COUNTY, NORTH CAROLINA
OPERABLE UNIT 2

STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedial action for the FCX Washington Site in Washington, Beaufort County, North Carolina, chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA) and, to the extent practicable, the National Contingency Plan (NCP). This decision is based on the administrative record file for this Site.

The State of North Carolina concurs with the selected remedy.

ASSESSMENT OF THE SITE

Actual or threatened releases of hazardous substances from this Site, has been addressed by implementing a time critical removal, and the imminent and substantial endangerment to public health, welfare, or the environment has been abated.

DESCRIPTION OF THE SELECTED REMEDY

This remedy addresses the sub-surface and surface soils that remain on Site following the Time Critical Removal. The remediation of the groundwater was addressed in September 1993 Operable Unit 1 Record of Decision.

The selected remedy: No Further Action

The five year review will include a thorough ecological assessment.

STATUTORY DETERMINATIONS

The selected remedy is protective of human health and the environment, complies with federal and state requirements that are legally applicable or relevant and appropriate to the remedial action, and is cost-effective. The soil remedy implemented during the removal utilized permanent solutions and alternative treatment technology to the maximum extent practicable, and satisfies the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element. Since this remedy may result in hazardous substances remaining onsite above health based levels, a review will be conducted within five years after commencement of remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment.

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DECISION SUMMARY

I. SITE NAME, LOCATION AND DESCRIPTION

A. Introduction

The FCX Washington Site (hereinafter referred to as the "FCX Site" or the "site") is defined as an area located on the western edge of Washington, North Carolina, in which soil, sediment, surface water, and groundwater were contaminated by multiple sources. Previous investigations have indicated that the former Farmers Cooperative Exchange (FCX) Inc. facility, comprised of seven tracts of land, was one of the major sources of concern. This facility acted as a farm supply distribution center which repackaged and sold pesticides, herbicides, and tobacco treating chemicals from 1945 to 1985. Five source areas of contamination related to these pesticide handling and disposal practices have since been identified in this area.

B. Site Description

The FCX Site is located approximately 1.5 miles northwest of and within the city limits of Washington, North Carolina, in west central Beaufort County (see Figure 1-1). The Site covers approximately 12 acres and is bounded on the northeast by the intersection of Grimes Road (SR 1402) and Whispering Pine Road (SR 1404), Mount Pleasant Canal to the east, wetlands leading to Kennedy Creek and Tar River to the south and southwest, and agricultural land to the west-northwest (see Figure 1-2). A site features map showing the approximate locations and limits of the warehouse, main chemical burial trench, blending building, and known features is provided in Figure 1-3.

Source area 1 is located between Grimes Road and the farmland, approximately 230 yards north-northwest of the former FCX warehouse, and is comprised primarily of several small to medium office/storage buildings and silos/tanks associated with the W.B. Gerard & Sons Inc. fertilizer and hardware company located at 425 Grimes Road. This source area is located on relatively flat terrain which has a gradual slope to the south and southwest. In addition, a man-made drainage ditch, located parallel and south of Grimes Road borders this source area to the northeast. This man-made drainage ditch also borders both source areas 2 and 3 to the northeast. Surface water in this ditch flows in a southeasterly direction prior to its confluence with the Mt. Pleasant Canal northwest of the Cleon Lathan residence (source area 3).

Former FCX operations and/or subsequent disposal activities within source area 1 could not be confirmed prior to or during the Remedial Investigation (RI). However, the deed search conducted as part of a PRP search indicates that source area 1 once belonged to FCX (Techlaw, 1988). Current operations at this source area by W. B. Gerard & Sons Inc. includes the distribution of agro-chemicals.

Source area 2 is located between Grimes Road and the farmland located 115 yards north-northwest of the former FCX warehouse. The significant site features of source area 2 include a large warehouse building and a gravel parking lot associated with the Charlie Tom's Restaurant & Oyster Bar (the former FCX blending building). A surface water drainage ditch originates in the southwest corner of source area 2, and water in this ditch flows in a southeasterly direction parallel to the southwest property line and the abandoned Seaboard Coastline Railroad Spur. This drainage ditch discharges into Mt. Pleasant Canal near the Cleon Lathan residence.

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Source area 3 is located between Grimes Road and the farmland located west of the former FCX warehouse and 50 yards north-northeast of this warehouse. Mount Pleasant Canal forms the eastern border of source area 3. The significant site features of this source area include a large warehouse building located in the northern portion of the source area, and the Cleon Lathan residence located in the southern portion of the source area, adjacent to the Mt. Pleasant Canal. At the time of the RI field investigation, residents occupied the large warehouse. Several small depressions/drainage ditches are also located in the center of source area 3 which divert surface water runoff northeast towards the drainage ditch parallel to Grimes Road. Source area 3 also contains a former loading dock (concrete ramp), several concrete grain silo support pads located south of and adjacent to the large warehouse building, and a secondary access road parallel to the abandoned Seaboard Coastline Railroad Spur. The access road connects the southwest corner of source area 2 (Charlie Tom's parking lot) with the paved entrance road to the Cecil Campbell Trucking Company (old FCX warehouse).

Source area 4 is located between source area 3 and source area 5. It consists of the Cecil Campbell Trucking Company warehouse (the old FCX warehouse), a paved entrance and parking lot located south of the warehouse, existing grain storage silos, a former grain storage silo, concrete support pads on the southwest corner of the warehouse, and secondary access roads that surround the warehouse to the north, west, and south. The Mt. Pleasant Canal borders source area 4 to the southeast. Water in a small surface drainage ditch originating at the former silo concrete support pad flows in a southeasterly direction between source areas 4 and 5, and discharges into Mt. Pleasant Canal near the waste stockpile (source area 5). In the southern part of source area 4 is a monitor well (WMW-1) which is located adjacent to the warehouse. This well was installed by Westinghouse.

Source area 5 is located south-southeast of source area 4, and north-northwest of a small agricultural field and the wetlands. The Mount Pleasant Canal borders source area 5 to the southeast. Located in this area are the excavated and backfilled main chemical burial trench, and the fenced contaminated pesticide waste stockpile. A small concrete block retaining wall and gravel pad where above ground storage tanks once existed, are located on the southwest corner of the fenced stockpile area. In the southeast part of source area 5 are three monitor wells (WMW-2, WMW-3, and WMW-4) which are located along the border between source area 5 and the small agricultural field. These wells were installed by Westinghouse.

C. Demography and Land Use

The city of Washington with an estimated population of 9,075 is located within a four-mile radius of the Site. Additionally, there are four minor population centers located within a four mile radius of the Site. These population centers include Washington Park centered three miles southeast of the Site, Chocowinity centered four miles south-southwest of the Site, Hootentown centered 3.5 miles east-southeast of the Site, and Wharton Station centered 3.9 miles northwest of the Site. Washington Park has an estimated population of 403 and Chocowinity has an estimated population of 624, based on 1990 census results. Demographic information was not available for Hootentown and Wharton Station which are unincorporated. Current land use around the Site is primarily light industrial, commercial, residential, and agricultural. Agricultural fields surround the Site to the north, west, southeast, and southwest. A 275-acre freshwater wetlands is located further to the south and southwest of the Site. The former abandoned city dump is located within these wetlands. Industries in the area include distribution centers for trucking, agro-chemical, propane, and manufacturing companies related to the textile industry. Commercial operations include a restaurant, grocery store, retail lumber and hardware store, day care nursery, barber shop, automobile parts store, insurance sales office, and a D.O.T. office located on Grimes Road north of the Site.

Residential neighborhoods are interspersed within the light industrial/commercial areas which

line the main roads within a three-mile radius of the Site. Approximately 11,350 residents are estimated to live within a three-mile radius of the Site. As previously mentioned, two structures including the large warehouse building and the Cleon Lathan residence located in source area 3 are inhabited.

Recreational areas near the FCX Site include a public swimming pool located on Grimes Road and a little league baseball field located east of the National Spinning Company. Tranters Creek, Kennedy Creek, Tar River, and Pamlico River are used occasionally for fishing and swimming purposes. Kennedy Creek, Tar River, and Pamlico River are classified for secondary recreation, indicating waters of lower quality (WPB, 1990).

The population in the vicinity of the Site obtains its potable water supply from either public water supply wells or from private wells. Industrial production wells are also located in the vicinity of the Site.

D. GEOLOGY

Three distinct lithostratigraphic units were penetrated during the subsurface investigation. They include the surficial undifferentiated sediments, the Yorktown Formation, and the upper portion of the Castle Hayne Limestone.

Directly beneath the Site lies the surficial undifferentiated sediments which are comprised of unconsolidated sand, silt, and clayey sand of Quaternary age. For the most part, the dominant lithology of the surficial unit is a fine to coarse grained quartz sand. Locally, within stream basins, these deposits have been chemically and mechanically eroded into alluvium. These alluvial deposits mantle deeper marine and non-marine sediments along surface waters. The thickness of surficial sediments underlying the Site ranges from 9 feet at MW-03 to 17 feet at MW-06, and averages 12.3 feet. In addition to naturally occurring deposits, there are localized zones where clean soil material was used to fill low lying or excavated areas at the Site.

Below the surficial deposits are the sediments of the Yorktown Formation. Based on existing well log data, surficial sediments gradually interfinger with sediments of the Yorktown Formation. The contact between these two units was determined from lithological variations observed in split spoon soil samples and is delineated by a near surface clay unit. This clay marks the top of the Yorktown Formation and was encountered at depths ranging from 9 to 17 feet bls. The Yorktown Formation underlying the Site consists of: an upper sandy, shelley, clay; an intermediate shelley, sand; and a lower sandy clay. The thickness of the upper sandy, shelley, clay varies from 6 feet at MW-06 to 12 feet at MW-02. The intermediate shell and sand unit varies in thickness from 16 feet at MW-02 to 28 feet at MW-01. The deeper sandy clay unit varies in thickness from 14 feet at MW-14 to 23 feet at MW-08. Overall, the Yorktown Formation varies from 40 feet at MW-01 to 42 feet at MW-08.

E. Hydrogeology

The FCX Site is underlain by seven aquifers. They include a surficial (water table) aquifer and six deeper semi-confined to confined aquifers. A more formal designation of these aquifer systems in order of increasing depth is as follows:

- Surficial/water table aquifer
- Yorktown aquifer
- Castle Hayne aquifer
- Beaufort aquifer
- Peedee aquifer
- Black Creek aquifer
- Cape Fear aquifer

The water table or surficial aquifer is comprised of undifferentiated surficial sands of recent age. The thickness of the water table aquifer ranges from 2.0 feet at MW-03 to 8.0 feet at MW-06, and averages 4.6 feet. Underlying the water table aquifer is the Yorktown aquifer. The Yorktown aquifer is semi-confined and is separated from the water table aquifer by the upper clayey sediments of the Yorktown Formation. This clay is formally designated as the upper Yorktown semi-confining unit and is continuous throughout the Site area. The thickness of the upper Yorktown semi-confining unit ranges from 6 to 12 feet, and averages 9 feet. Below this upper semi-confining unit are the permeable sediments that comprise the Yorktown aquifer. These sediments consist primarily of shells and sand. The saturated thickness of the Yorktown aquifer ranges from 16 to 27 feet, and averages 23 feet. The base of the Yorktown aquifer is formed by the clays of the Yorktown Formation and of the Castle Hayne Limestone. Formally this clay unit is designated as the Castle Hayne confining unit (Winner and Coble, 1989). Only the upper portion of the Castle Hayne confining unit was penetrated during the RI subsurface investigation, and therefore its exact thickness below the FCX Site is not known. Based on Site lithologic data, it is known that the Castle Hayne confining unit is at least 38 feet thick. The Yorktown aquifer is the deepest aquifer that was penetrated during the subsurface investigation.

The deeper aquifer systems underlying the Yorktown aquifer are important from a hydrogeological perspective. However, they are unaffected by the Site. As a result, these systems are not discussed in this document. Additional information on these systems is available in the Remedial Investigation report.

F. Climate/Meteorology

The climate, is moderate with warm and humid summers, and calm winters. Summers are long and quite warm, with afternoon temperatures averaging 90 5F. approximately 33% of the midsummer days, and with sea breezes generally occurring around noon to alleviate the inland heat. During winter, numerous polar air masses reach the middle Atlantic Coast causing sharp drops in temperatures. The temperature, however, rarely falls below freezing. The average annual temperature for the period 1945-1982 is 63 5F (NOCD, 1986).

Rainfall is generally evenly distributed throughout the year with the driest weather usually occurring in the spring and the wettest weather occurring in the summer. Summer rainfall comes principally from thunderstorms which occur one out of every three to four days during the summer. Winter rain is generally a slow, steady rain or drizzle only lasting one or two days. Seldom is there a winter without a few flakes of snow. However, several years may pass without a measurable amount.

II. SITE HISTORY AND ENFORCEMENT ACTIVITIES

A. Site History

The FCX facility operated a farm supply distribution center which repackaged and sold pesticides, herbicides, and tobacco treating chemicals from 1945 to 1985. From 1960 to 1981, an unknown amount of chemical waste in plastic containers and paper bags, generated by FCX, waste

buried in an on-site landfill located in source area 5, southwest of the former FCX warehouse (NCDHR, 1987).

Since mid-1986 to date, several site investigations have been performed at the FCX Site. Sampling studies have been conducted by local, state, and federal agencies, as well as private consultants to FCX Inc. and Fred Webb, Inc. These previous site investigations, however, have been primarily limited to source areas 2 and 5 of the former FCX facility (see Figure 1-3). In September 1990, EPA initiated this Remedial Investigation/Feasibility Study (RI/FS) to address all potential source areas and associated contamination at the FCX Site.

B. SUMMARY OF PREVIOUS INVESTIGATIONS

In July of 1986, a preliminary assessment of the FCX Site was prepared by the North Carolina Department of Human Resources (NCDHR). This preliminary assessment indicated that pesticides, in the form of toxic powder and liquid wastes, were buried on-site, and a potential for groundwater, soil, and drinking water contamination existed. The report recommended that a site investigation be performed.

The FCX Site was inspected by the NCDHR, Solid and Hazardous Waste Management Branch, on August 26, 1986. Chemical analyses revealed the presence of aldrin, dieldrin, chlordane, DDT, DDE, DDD, hexachlorobenzene, carbon disulfide, naphthalene, phenanthrene, acenaphthylene, fluorene, dibenzofuran, 2-methylnaphthalene, and mercury at measurable concentrations. No volatile organic, semi-volatile organic, pesticide, or metal contamination was revealed in any of the five groundwater samples collected. Ambient air monitoring during the Site inspection using an HNU did not detect volatile organic compounds (VOCs) above background levels.

In May of 1987, FCX Inc. employed the resources of Rose and Purcell, Inc., and GSX, Inc., to study the on-site contamination and clear the chemical warehouse located in source area 4. Chemical analysis of one soil sample collected by GSX in the vicinity of the main chemical burial trench revealed the presence of toxaphene at a concentration of 2400 milligrams/kilogram (mg/kg) and copper at a concentration of 480 mg/kg, among other contaminants (McLaughlin, 1987).

August of 1988, EPA Region IV's technical assistance team (TAT) conducted a site reconnaissance sampling investigation. An electromagnetic survey (EM-31) and a magnetic survey were used to identify the boundaries of the chemical burial trenches located in source area 5 (TAT, 1989). Soil samples collected near the main chemical burial trench during the 1988 sampling investigation revealed the presence of elevated concentrations of DDD, DDE, DDT, Alpha-Chlordane, Gamma-Chlordane, Dieldrin, Phenol, Heptachlor Methoxychlor.

In January of 1989, a removal action at the Site was initiated in which approximately 3000 cubic yards (cy) of contaminated soil was excavated from the main chemical burial trench located in source area 5. The soil was stockpiled within a secured area in the southern corner of this source area (TAT, 1989).

Additionally, in 1990, TAT collected soil samples from the area surrounding the former FCX blending building (Charlie Toms Restaurant & Oyster Bar) located in source area 2 (see Figure 5-1). Subsequently in late January, an additional 49 cy of contaminated soil was excavated from the area surrounding the former FCX blending building. This removed waste was consolidated with the previously removed waste located in source area 5 (TAT, 1991).

In association with the 1990 TAT sampling investigation and subsequent removal action activities at the Site, additional soil sampling in source area 2 revealed the presence of pesticides, volatile organics, and semi-volatile organics at elevated concentrations (TAT, 1991).

In July of 1990, in response to a report that the permalon liner covering the contaminated soil stockpile was torn, EPA constructed a temporary containment berm around the waste stockpile to prevent potential contamination runoff, and repaired the torn liner (TAT, 1991). During this operation, additional buried material located two feet below ground surface (with a total pesticides concentration of 103 mg/kg) was identified at the northern corner of the stockpile (TAT, 1991).

In August of 1990, a groundwater sampling investigation in the vicinity of the former warehouse and chemical burial trench was performed by Westinghouse Environmental and Geotechnical Services, Inc. for Fred Webb Grain, Inc. Four 2-inch stainless steel wells were installed in source areas 4 and 5. Analyses of groundwater samples collected from the Westinghouse wells revealed elevated levels of endrin, 4,4 DDD.

In December 1990 approximately 1,500 cubic yards of contaminated soils were removed from the stockpile and transported to a permitted landfill in Alabama. Approximately 700 cubic yards were left in the stockpile on-site. On-site survey work was conducted in October 1991 to better define two additional trenches which were previously identified. Samples were collected of the additional burial areas in mid-November 1991.

January 21, 1992, an EPA removal action was taken to excavate approximately 2000 cubic yards of contaminated materials and soils which were placed in the stockpile. In September 1992 a removal of the remainder of the contaminated soils was conducted. During the September 1992 removal approximately 3,000 cubic yards of contaminated soil was bagged and placed in the FCX warehouse. The remaining 11,600 cubic yards of contaminated soils would remain in the stockpile located in source area 5.

The actual treatment of approximately 15,000 cubic yards of contaminated soil was completed in May 1996.

C. Enforcement Activities

The FCX Site was listed on the National Priority List in March of 1989.

In October and November of 1988, the EPA and the State of North Carolina joined in legal action to secure the remaining assets of the bankrupt FCX Corporation prior to their disbursement to the investors. The proceedings occurred within the Federal Bankruptcy Court in Raleigh, North Carolina. In July 14, 1992 a Trust Agreement was entered, which provided that FCX could not abandon the property at the FCX-Washington Site and that a portion of the remaining assets were to be divided between the FCX-Washington Site and the FCX Statesville Site. The actual allocation for the FCX Washington Site was $1,750,000.00.

In March 30, 1992 the Agency entered into a consent decree with Fred Webb Inc. The settlement was for $540,000.00, to be paid over a five year period.

III. HIGHLIGHTS OF COMMUNITY PARTICIPATION

Pursuant to CERCLA º113(K)(2)(B)(I-v) and º117, the RI/FS Report and the Proposed Plan for the FCX Washington Site were released to the public for comment on April 20, 1993. These documents were made available to the public in the administrative record located in the information repository maintained at the EPA Docket Room in Region IV and at the Brown Library in Washington, North Carolina.

The notice of availability for these documents was published in the Washington Daily News on August 22, 1996. A public comment period on the documents was held from August 22, 1996 to

September 20, 1996. A copy of the notice was mailed to the public. In addition, a public meeting was held on August 29, 1996. At this meeting, representatives from EPA answered questions about problems at the Site and the remedial alternatives under consideration.

Other community relations activities included;

- Community Relations Plan finalized on February 6, 1991 and a copy was placed in the information repository.
- Issuance of a Fact Sheet on the RI/FS process in September 1991.
- Public meeting on October 3, 1991, to discuss the superfund process. The meeting was announced by a display ad that appeared in the newspapers on September 26, 1991.
- Public notice was mailed to citizens informing them that EPA was beginning the second phase of removal activities at the Site.
- Issuance of a Fact Sheet updating the RI/FS activities in December 1992.
- Issuance of a Fact Sheet on the Proposed Plan in April 1993.
- Proposed Plan Public Meeting for the ground water remediation held on May 4, 1993. The meeting was announced by display ad on April 20, 1993.
- Notice mailed to citizens and appeared in area newspaper on May 17, 1993 announcing 30-day extension of public comment period which was extended until midnight June 18, 1993.
- An announcement for the August 29, 1996 proposed plan public meeting was placed in the Washington Daily News on August 22, 1996.
- The public meeting was held on August 29, 1996 at the City Council Chambers, Washington, North Carolina.

IV. SCOPE AND ROLE OF RESPONSE ACTION WITHIN SITE STRATEGY

The FCX Washington Site has been divided into units or phases, referred to as "operable units". The operable units (OUs) at this Site are:

OU One: Contaminated ground water.
OU Two: Residual Soil Contamination.

This approach was taken because the soil and source contamination was addressed via a time-critical removal action. This removal action addressed all soil/source contamination to the point no further remediation is required.

V. SUMMARY OF SITE CHARACTERISTICS

The Remedial Investigation (RI) at the FCX Washington Site included the characterization of the following routes of contaminant migration: soil, groundwater, surface water and sediment contamination.

A. Soil Investigation

The Remedial Investigation included a thorough soil investigation that encompassed the sampling of soils within each of the source areas identified at the Site. The results of the investigation were used to facilitate the four stage removal action being conducted at the Site.

The actual removal of contaminated soil was conducted in three stages.

In January of 1989 2,200 cubic yards of pesticide contaminated soil and debris were excavated and stockpiled on Site.

In January of 1992 EPA excavated an additional 2,000 cubic yards of contaminated soil and added it to the existing stockpile.

The third stage of the removal action began in September of 1992, during which 3,110 cubic yards of the existing stockpile was bagged and placed in the on-site warehouse for storage, and an additional 11,600 cubic yards of contaminated soil was excavated and stockpiled on-site.

The fourth stage consisted of treatment of the contaminated soils stored on Site via thermal desorption.

The removal action was implemented to the extent no restrictions are placed on the future use of the Site. Locations of the final removal are depicted in Figures 5-1, 2, 3 and 4. The risk characterization of the soils remaining on site is addressed in Section VI of this document.

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VI. SUMMARY OF SITE RISKS

The FCX Washington Site is releasing contaminants into the environment. The Baseline Risk Assessment(BRA)Report presents the results of a comprehensive risk assessment that addresses the potential threats to public health and the environment posed by the Site under current and future conditions, assuming that no remedial actions take place, and that no restrictions are placed on future use of the Site. This document addresses risks attributable to soil, sediment, and air only; risks associated with groundwater exposure routes were reported previously.

The Baseline Risk Assessment Report consists of the following sections: identification of chemicals of potential concern; toxicity assessment; human exposure assessment, risk characterization; and environmental assessment. All sections are summarized below.

A. Chemicals of Potential Concern

Data collected during the RI was reviewed and evaluated to determine the chemicals of potential concern at the Site which are most likely to pose risks to the public health. These contaminants were chosen for each environmental media sampled.

Once these chemicals of concern were identified, exposure concentrations in each media were estimated. Exposure point concentrations were calculated using the lesser of the 95 percent upper confidence limit concentration or the maximum detected value as the reasonable maximum exposure (RME) point concentration. Exposure point concentrations for the chemicals of potential concern are shown in Appendix C of the Remedial Investigation Report.

B. Exposure Assessment

The exposure assessment evaluates and identifies complete pathways of exposure to human population on or near the Site. Current and future exposure scenarios include ingestion of and dermal contact with the on-site soils/sediments and inhalation of fugitive dust. This Site is unique in the fact that there are varying uses through out the Site. For that reason the risk is characterized by individual source area. Further detail and mathematical calculations can be reviewed in the Baseline Risk Assessment. Table 6-2 provides the exposure assumptions that were used in the BRA.

TABLE 6-2
EXPOSURE ASSUMPTIONS

	Child Resident	Adult Resident	Adult Worker
Body weight (kg)	16	70	70
Exposure Frequency (days/year)	350	350	250
Exposure Duration (years)	6	24	25
Ingestion Rate (Soil) (mg/day)	200	100	50
Exposed skin Area (cm 2)	5000	5170	1980
Inhalation Rate (m 3/day)	15	20	20

C. Toxicity Assessment

Under current EPA guidelines, the likelihood of adverse effects occurring in humans from carcinogens and noncarcinogens are considered separately. These are discussed below. Tables 6-3 and 6-4 summarize the carcinogenic and noncarcinogenic toxicity criteria for the chemicals of potential concern.

Cancer slope factors (CSFs) have been developed by EPA for estimating excess lifetime cancer risk associated with exposure to potentially carcinogenic chemicals. CSFs, which are expressed in units of (mg/Kg-day) -1, are multiplied by the estimated intake dose of a potential carcinogen, in mg/kg-day, to provide an upperbound estimate of the excess lifetime cancer risk associated with exposure at that intake level. The term "upperbound" reflects the conservative estimate of the risks calculated from the slope factor. Use of this approach makes underestimation of the actual cancer risk highly unlikely. Cancer potency factors are derived from the results of human epidemiological studies or chronic animal bioassays to which animal-to-human extrapolation and uncertainty factors have been applied.

Table 6-3
Cancer Slope Factors, Tumor Sites and EPA Cancer Classifications for Chemicals of Potential Concern
FCX Washington Site
Washington, North Carolina

Chemical of Potential Concern	Cancer Slope Factor CSFo		ABSeff	CSFd	CSFi	Tumor Sites	EPA Class
1,2-Dichloroethane	9.10E-02	i	80%	1.1E-01	9.1E-02	Several sites	B2
1,2-Dichloropropane	6.80E-02	h	80%	8.5E-02	NA	NA	D
1,2,4-Trichlorobenzene	NA		50%	NA	NA	NA	D
2-Methylnaphthalene	NA		50%	NA	NA	NA	D
2-Methylphenol	NA		50%	NA	NA	NA	D
2,3,7,8-TCDD TEQ	1.56E+05	h	50%	3.1E+05	1.16E+05	Liver	B2
2,4,5-Trichlorophenol	NA		50%	NA	NA	NA	D
3,3-Dichlorobenzidene	4.50E-01	i	50%	9.0E-01	NA	NA	D
4,4'-DDD (p,p'-DDD)	2.4E-01	i	50%	4.8E-01	NA	Lung, liver, thyroid	B2
4,4'-DDE (p,p'-DDE)	3.4E-01	i	50%	6.8E-01	NA	Liver, thyroid	B2
4,4'-DDT (p,p'-DDT)	3.4E-01	i	50%	6.8E-01	NA	Liver	B2
Acenaphthylene	NA		50%	NA	NA	NA	D
Acenaphthene	NA		50%	NA	NA	NA	D
Aldrin	1.7E+01	i	50%	3.4E+01	1.7E+01	Several tumor sites	B2
Alpha-BHC	6.30E+00	i	50%	1.3E+01	6.3E+00	Liver	B2
Alpha-chlordane	1.3E+00	i	50%	2.6E+00	1.29E+00	Liver	B2
Aluminum	NA		20%	NA	NA	NA	D
Anthracene	NA		50%	NA	NA	NA	D
Antimony	NA		20%	NA	NA	NA	D
Arsenic	1.50E+00	i	20%	7.5E+00	1.51E+01	Skin	A
Barium	NA		20%	NA	NA	NA	D
Benzene	2.90E-02	i	80%	3.6E-02	2.9E-02	Leukemia	A
Benzo(a)anthracene	7.30E-01	e	50%	1.5E+00	6.1E-01	Forestomach	B2
Benzo(b &/or k)fluoranthene	7.30E-01	i	50%	1.5E+00	6.1E-01	Forestomach	B2
Benzo(g,h,i)perylene	NA		50%	NA	NA	NA	D
Benzo(a)pyrene	7.30E+00	i	50%	1.5E+01	6.1E+00	Forestomach	B2
Beryllium	4.30E+00	i	20%	2.2E+01	8.4E+00	All sites	B2
Beta-BHC	1.80E+00	i	50%	3.6E+00	1.8E+00	Liver	B2
Bis(2-ethythexyl)phthalate	1.40E-02	i	50%	2.8E-02	NA	Liver	B2
Butyl benzyl phthalate	NA		50%	NA	NA	Leukemia in rats	C
Cadmium	NA		20%	NA	6.3E+00	Lung	B2
Carbazole	2.0E-02	h	50%	4.0E-02	NA	Liver	B2
Chlorobenzene	NA		80%	NA	NA	NA	D
Chloroform	6.10E-03	i	80%	7.6E-03	8.1E-02	Liver	B2
Chromium VI	NA		20%	04.2E+01	NA	NA	D
Chrysene	7.30E-03	e	50%	1.5E-02	6.1E-03	Forestomach	B2
Cobalt	NA		20%	NA	NA	NA	D
Copper	NA		20%	NA	NA	NA	D
Cyanide	NA		20%	NA	NA	NA	D
Delta-BHC	1.30E+00		50%	2.6E+00	NA	Liver	B2
Dibenzo(a,h)anthracene	7.30E+00	e	50%	1.5E+01	6.1E+00	Forestomach	B2
Dibenzofuran	NA		50%	NA	NA	NA	D

Sources:
i- IRIS
h - HEAST
e - ECAO
w - Withdrawn from IRIS or HEAST
a - HEAST Alternate

EPA Cancer Classes:
A - Human carcinogen
B - Probable human carcinogen
C - Possible human carcinogen
D - Not classifiable as a human carcinogen

CSFo - Cancer Slope Factor (oral), (mg/kg/day)-1
CSFd - Cancer Slope Factor (dermal), (mg/kg/day)-1
ABSeff - Absorption efficiency: 20% inorganics, 50% semivolatiles, 80% volatiles
NA - Not applicable (no data)

Toxicity value surrogates:
pyrene used for acenaphthylene, benzo(g,h,i)perylene, and phenanthrene
naphthalene used for 2-methylnaphthalene
gamma BHC used for delta BHC
benzo(b)fluoranthene used for benzo(k)fluoranthene
endosulfan used for endosulfan I and endosulfan sulfate
endrin used for endrin ketone, endrin aldehyde

Table 6-3
Cancer Slope Factors, Tumor Sites and EPA Cancer Classifications for Chemicals of Potential Concern
FCX Washington Site
Washington, North Carolina

Chemical of Potential Concern	Cancer Slope Factor CSFo	ABSeff	CSFd	CSFi	Tumor Sites	EPA Class
Dieldrin	1.60E+01 i	50%	3.2E+01	1.6E+01	Liver	B2
Di-n-butylphthalate	NA	50%	NA	NA	NA	D
Di-n-octylphthalate	NA	50%	NA	NA	NA	D
Endosulfan I (alpha)	NA	50%	NA	NA	NA	D
Endosulfan sulfate	NA	50%	NA	NA	NA	D
Endrin	NA	50%	NA	NA	NA	D
Endrin aldehyde	NA	50%	NA	NA	NA	D
Endrin ketone	NA	50%	NA	NA	NA	D
Ethylbenzene	NA	80%	NA	NA	NA	D
Fluoranthene	NA	50%	NA	NA	NA	D
Fluorene	NA	50%	NA	NA	NA	D
Gamma-BHC (Lindane)	1.30E+00 h	50%	2.6E+00	NA	Liver	B2
Gamma-Chlordane	1.3E+00 i	50%	2.6E+00	1.29E+00	Liver	B2
Heptachlor	4.5E+00 i	50%	9.0E+00	4.55E+00	Liver	B2
Heptachlor epoxide	9.10E+00 i	50%	1.8E+01	9.10E+00	Liver	B2
Hexachlorobenzene	1.60E+00 i	80%	2.0E+00	1.6E+00	Liver, thyroid, kidney	B2
Hexachlorobutadiene	7.80E-02 i	80%	9.8E-02	7.7E-02	Liver	B2
Indeno(1,2,3-cd)pyrene	7.30E-01 e	50%	1.5E+00	6.1E-01	Forestomach	B2
Iron	NA	20%	NA	NA	NA	D
Lead	NA	20%	NA	NA	Kidney	B2
Manganese	NA	20%	NA	NA	NA	D
Mercury	NA	20%	NA	NA	NA	D
Methoxychlor	NA	50%	NA	NA	NA	D
Naphthalene	NA	50%	NA	NA	NA	D
Nickel	NA	20%	NA	NA	NA	D
Pentachlorophenol	1.2E-01 i	50%	2.4E-01	NA	Several sites	B2
Phenanthrene	NA	50%	NA	NA	NA	D
Pyrene	NA	50%	NA	NA	NA	D
Selenium	NA	20%	NA	NA	NA	D
Silver	NA	20%	NA	NA	NA	D
Tetrachloroethene	5.20E-02 e	80%	6.5E-02	2.0E-03	Liver	NA
Toluene	NA	80%	NA	NA	NA	D
Total xylenes	NA	80%	NA	NA	NA	D
Toxaphene	1.10E+00 i	50%	2.2E+00	1.1E+00	Liver, thyroid	B2
Trichloroethene	1.10E-02 w	80%	1.4E-02	6.0E-03	Liver	NA
Vanadium	NA	20%	NA	NA	NA	D
Zinc	NA	20%	NA	NA	NA	D

Sources:
i - IRIS
h - HEAST
e - ECAO
w - Withdrawn from IRIS or HEAST
a - HEAST Alternate

EPA Cancer Classes:
A - Human carcinogen
B - Probable human carcinogen
C - Possible human carcinogen
D - Not classifiable as a human carcinogen

CSFo - Cancer Slope Factor (oral), (mg/kg/day)-1
CSFd - Cancer Slope Factor (dermal), (mg/kg/day)-1
ABSeff - Absorption efficiency: 20% inorganics, 50% semiviolatiles, 80% volatiles
NA - Not applicable (no data)

Toxicity value surrogates:
pyrene used for acenaphthalene, benzo(g,h,i)perylene, and phenanthrene
naphthalene used for 2-methlynaphthalene
gamma BHC used for delta BHC
benzo(b)fluoranthene used for benzo(k)fluoranthene
endosulfan an used for endosulfan I and endosulfan sulfate
endrin used for endrin ketone, endrin aldehyde

Table 6-4
Reference Doses and Target Sites for
Chemicals of Potential Concern
FCX Washington Site
Washington, North Carolina

Chemical of Potential Concern	Reference Dose RfDo		ABSeff	RfDd	RfDi	Target Sites / Effects
Dieldrin	5E-05	i	50%	3E-05	NA	Liver lesions
Di-n-butylphthalate	1E-01	i	50%	5E-02	NA	Incr. mortality
Di-n-octylphthalate	2E-02	h	50%	1E-02	NA	Not specified
Endosulfan I (alpha)	6E-03		50%	3E-03	NA	Kidney
Endosulfan sulfate	6E-03		50%	3E-03	NA	Kidney
Endrin	3E-04	i	50%	2E-04	NA	Liver
Endrin aldehyde	3E-04		50%	2E-04	NA	Liver
Endrin ketone	3E-04		50%	2E-04	NA	Liver
Ethylbenzene	1E-01	i	80%	8E-02	2.86E-01	Liver, kidney
Fluoranthene	4E-02	i	50%	2E-02	NA	Kidney, liver effects
Fluorene	4E-02	i	50%	2E-02	NA	Decr. red blood cells
Gamma-BHC (Lindane)	3E-04	i	50%	2E-04	NA	Liver, kidney
Gamma-Chlordane	6E-05	i	50%	3E-05	NA	Liver hypertrophy
Heptachlor	5E-04	i	50%	3E-04	NA	Incr. liver weight
Heptachlor epoxide	1E-05	i	50%	7E-06	NA	Incr. liver:body weight ratio
Hexachlorobenzene	8E-04	i	80%	6E-04	NA	Liver effects
Hexachlorobutadiene	2E-04	h	50%	1E-04	NA	Not specified
Indeno(l,2,3-cd)pyrene	NA		50%	NA	NA	NA
Iron	3E-01	e	20%	6E-02	NA	NOAEL
Lead	NA		20%	NA	NA	CNS effects, blood
Manganese	2E-02	i	20%	5E-03	1.43E-05	NOAEL
Mercury	3E-04	h	20%	6E-05	8.57E-05	NOAEL
Methoxychlor	5E-03	i	50%	3E-03	NA	Liver
Naphthalene	4E-02	w	50%	2E-02	NA	Not specified
Nickel	2E-02	i	20%	4E-03	NA	Decr. body/organ weights
Pentachlorophenol	3E-02	i	50%	2E-02	NA	Liver, kidney
Phenanthrene	3E-02	i	50%	2E-02	NA	Not specified
Pyrene	3E-02	i	50%	2E-02	NA	Kidney effects
Selenium	5E-03	i	20%	1E-03	NA	Selenosis
Silver	5E-03	i	20%	1E-03	NA	Argyria
Tetrachloroethene	1E-02	i	80%	8E-03	NA	Liver
Toluene	2E-01	i	80%	2E-01	1.14E-01	Changes in liver, kidney
Total xylenes	2E+00	i	80%	2E+00	NA	Liver
Toxaphene	NA		50%	NA	NA	NA
Trichloroethene	6E-03	e	80%	5E-03	NA	Liver
Vanadium	7E-03	i	20%	1E-03	NA	NOAEL
Zinc	3E-01	i	20%	6E-02	NA	Decr. enzyme levels

Sources:
i - IRIS
h - HEAST
e - ECAO
w - Withdrawn from IRIS or HEAST
a - HEAST Alternate

RfDo - Reference Dose (oral), (mg/kg/day)
ABSeff - Absorption efficiency
RfDd - Reference Dose (dermal), (mg/kg/day)
NA - Not Applicable (no data)

Toxicity value surrogates:
pyrene used for acenaphthylene, benzo(g,h,i)perylene, and phenanthrene
naphthalene used for 2-methlynaphthalene
gamma BHC used for delta BHC
benzo(b)fluoranthene used for benzo(k)fluoranthene
endosulfan used for endosulfan I and endosulfan sulfate
endrin used for endrin ketone, endrin aldehyde

Table 6-4
Reference Doses and Target Sites for
Chemicals of Potential Concern
FCX Washington Site
Washington, North Carolina

Chemical of Potential Concern	Reference Dose RfDo		ABSeff	RfDd	RfDI	Target Sites / Effects
1,2-Dichloroethane	NA		80%	NA	NA	NA
1,2-Dichloropropane	NA		80%	NA	1.14E-03	Nasal mucosa
1,2,4-Trichlorobenzene	1E-02	i	80%	8E-03	5.71E-02	Incr. adrenal weights
2-Methylnaphthalene	4E-02	w	50%	2E-02	NA	Not specified
2-Methylphenol	5E-02	1	50%	3E-02	NA	Decr. body weight
2,3,7,8-TCDD TEQ	NA		50%	NA	NA	NA
2,4,5-Trichlorophenol	1E-01	i	50%	NA	NA	Liver
3,3-Dichlorobenzidene	NA		50%	NA	NA	NA
4,4'-DDD(p,p'-DDD)	NA		50%	NA	NA	NA
4,4'-DDE(p,p'-DDE)	NA		50%	NA	NA	NA
4,4'-DDT(p,p'-DDT)	5E-04	i	50%	3E-04	NA	Liver lesions
Acenaphthylene	3E-02	i	50%	2E-02	NA	Not specified
Acenaphthene	6E-02	i	50%	3E-02	NA	Not specified
Aldrin	3E-05	i	50%	2E-05	NA	Liver
Alpha-BHC	NA		50%	NA	NA	NA
Alpha-Chlordane	6E-05	i	50%	3E-05	NA	Liver hypertrophy
Aluminum	1E+00	e	20%	2E-01	NA	Not specified
Anthracene	3E-01	i	50%	2E-01	NA	Not specified
Antimony	4E-04	i	20%	8E-05	NA	Longevity, blood glucose
Arsenic	3E-04	i	20%	6E-05	NA	Hyperpigmentation
Barium	7E-02	a	20%	1E-02	1.43E-04	Incr- blood pressure
Benzene	NA		80%	NA	1.71E-03	Not specified
Benzo(a)anthracene	NA		50%	NA	NA	NA
Benzo(b &/or k)fluoranthene	NA		50%	NA	NA	NA
Benzo(g,h,i)perylene	3E-02	i	50%	2E-02	NA	Not specified
Benzo(a)pyrene	NA		50%	NA	NA	NA
Beryllium	5E-03	i	20%	1E-03	NA	NOAEL
Beta-BHC	NA		50%	NA	NA	NA
Bis(2-ethylhexyl)phthalate	2E-02	i	50%	1E-02	NA	Incr. liver weight
Butyl benzyl phthalate	2E-01	i	50%	1E-01	NA	Incr. liver:body weight
Cadmium	5E-04	i	20%	1E-04	5.71E-05	NOAEL
Carbazole	NA		50%	NA	NA	NA
Chlorobenzene	2E-02	i	80%	2E-02	5.71E-03	Liver lesions
Chloroform	1E-02	i	80%	8E-03	NA	Liver
Chromium VI	5E-03	i	20%	1E-03	NA	NOAEL
Chrysene	NA		50%	NA	NA	NA
Cobalt	6E-02	e	20%	1E-02	NA	Not specified
Copper	4E-02	e	20%	8E-03	NA	Not specified
Cyanide	5E-03	i	20%	1E-03	NA	NOAEL
Delta-BHC	3E-04	i	50%	2E-04	NA	NA
Dibenzo(a,h)anthracene	NA		50%	NA	NA	NA
Dibenzofuran	4E-03	e	50%	2E-03	NA	Not specified

Sources:
i - IRIS
h - HEAST
e - ECAO
w - Withdrawn from IRIS or HEAST
a - HEAST Alternate

RfDo - Reference Dose (oral), (mg/kg/day)
ABSeff - Absorption efficiency
RfDd - Reference Dose (dermal), (mg/kg/day)
NA - Not Applicable (no data)

Toxicity value surrogates:
pyrene used for acenaphthylene, benzo(g,h,i)perylene, and phenanthrene
naphthalene used for 2-methlynaphthalene
gamma BHC used for delta BHC
benzo(b)fluoranthene used for benzo(k)fluoranthene
endosulfan used for endosulfan I and endosulfan sulfate
endrin used for endrin ketone, endrin aldehyde

Reference Doses (RfDs) have been developed by EPA for indication of the potential for adverse health effects from exposure to chemicals exhibiting noncarcinogenic effects. RfDs, which are expressed in units of mg/kg-day, are estimates of acceptable lifetime daily exposure levels for humans, including sensitive individuals. Estimated intake dose of chemicals from environmental media can be compared to the RfD. RfDs are derived from human epidemiological studies or animal studies to which uncertainty factors have been applied. These uncertainty factors help ensure that the RfDs will not underestimate the potential for adverse noncarcinogenic effects to occur.

In the case of lead, EPA recommends the use of the Agency's Uptake Biokinetic model which predicts blood-lead levels for children ages 0.5-7 years under various exposure scenarios and lead concentrations.

D. Risk Characterization

The risk characterization step of the baseline risk assessment process integrates the toxicity and exposure assessments into quantitative and qualitative expressions of risk. The output of this process is a characterization of the site-related potential noncarcinogenic and carcinogenic health effects.

Potential concern for noncarcinogenic effects of a single contaminant in a single medium is expressed as the hazard quotient (HQ), or the ratio of the estimated intake derived from the contaminant concentration in a given medium to the contaminant's reference dose. By adding the HQs for all contaminants within a medium or across all media to which a given population may be reasonably exposed, the hazard Index (HI) can be generated. Calculation of a HI in excess of unity indicates the potential for adverse health effects. Indices greater than one will be generated anytime intake for any of the chemicals of concern exceeds its Reference Dose (RfD). However, given a sufficient number of chemicals under consideration, it is also possible to generate a HI greater than one even if none of the individual chemical intakes exceeds their respective RfDs.

Carcinogenic risk is expressed as a probability of developing cancer as a result of lifetime exposure to a contaminant concentration in a given medium. Excess lifetime cancer risks are determined by multiplying the intake level with the cancer potency factor. EPA's acceptable target range for carcinogenic risk is one-in-ten-thousand (1E-4) to one-in-one-million (1E-6).

Neither a cancer slope factor nor a reference dose is available for lead. Instead, blood lead concentrations have been accepted as the best measure of exposure to lead. The EPA has developed a biokinetic /uptake model to assess chronic and nonchronic exposure of children to lead. The uptake/biokinetic model estimates total lead uptake resulting from diet, inhalation, and ingestion of soil/dust, water, paint, and placental transport to the fetus. The uptake/biokinetic model calculates the uptake and blood lead levels for the most sensitive population, children ages 0.5 to 7 years old. EPA uses a blood lead level of 10 micrograms per deciliter (ug/dl) as the benchmark to evaluate lead exposure.

Current use

As a result of the varying uses of the Site the risk characterization is quantified by individual source area, which are summarized in Table 6-5.

E. Environmental Assessment

Chemicals of potential concern are found in surface soils, subsurface soils, and sediments, and surface waters. Potential exposure pathways for chemicals in soils include dermal contact, soil ingestion, inhalation of airborne particulates, inhalation of chemical vapors, and exposure via

bioaccumaulation within the food chain. Significant uptake via the dermal route would be limited to lipophilic compounds which can cross the epidermis.

The contaminants of potential ecological concern were selected based on comparison of the concentration of the chemicals in environmental media with background concentrations and /or available comparable toxicity data. Table 6-6 list the contaminants of potential ecological concern and the rationale for their selection.

The elevated chemical levels in surface waters indicate that these chemicals may have a potential impact upon terrestrial and aquatic organisms. The results of the ecological sampling in the adjacent wetlands are discussed in the RI report. Dry conditions at the time of the sampling limited the scope of the investigation. Based only on one site sample compared to a background sample, a small impact on the benthic community in the study area was identified. Fish tissue analyses indicate that higher levels of DDD, DDE, and DDT are present in fish collected from the study site. Species diversity and equitability measurements of the macroinvertebrate communities at stream stations down gradient of the Site are generally less than those of the control stream stations, both benthic communities appear to be healthy in terms of diversity.

TABLE 6-6
CONTAMINANTS OF POTENTIAL ECOLOGICAL CONCERN
FCX WASHINGTON SITE
WASHINGTON, NORTH CAROLINA

PARAMETER	Media	Control	Range of Detects	Average	Frequency	Rationale for Inclusion
	(1)	(2)	(3)	(4)	(5)	
BERYLLIUM	SS	0.51	0.22-2.20	0.83	27/42	Exceeds 2x background concentration in soil
NICKEL	SS	1.9-4.6	2-140	16	23/42	Exceeds 2x background concentration in soil
LEAD	SS	7.1-150	2.8-420	67.71	42/42	Exceeds 2x background concentration in soil
	SW	NA	9-35	22	3/3	Exceeds Ambient Water Quality Criteria (AWQC)
	SD	NA	13-210	81	9/9	Exceeds Effects Range-Medias (ER-M) for sediment
ZINC	SS	14-48	7.8-3100	401	42/42	Exceeds 2x background concentration in soil
	SW	NA	35-62	51	3/3	Exceeds AWQC
	SD	14-48	51-500	147	8/9	Exceeds ER-M for sediment.
MERCURY	SS	ND(0.12-0.60)	0.31-4.1	0.31	9/42	Exceeds 2x background concentration in soil
	SW	NA	0.31	0.31	2/3	Exceeds AWQC
	SD	ND(0.12-0.60)	0.29-0.76	0.53	2/9	Exceeds ER-L for sediment.
MANGANESE	SS	10-110	14-590	99	42/42	Exceeds 2x background concentration in soil
ALDRIN	SS	ND(1.8-2.2)	1.6-240	65.53	6/42	Exceeds 2x background concentration in soil
HEPTACHLOR	SS	ND(1.8-2.2)	0.98-370	84.74	5/42	Exceeds 2x background concentration in soil
HEPTACHLOR EPOXIDE	SS	ND(1.8-2.2)	2.7-90	19.28	8/42	Exceeds 2x background concentration in soil
ALPHA-BHC	SS	ND(1.8-2.2)	7.9	7.9	1/42	Exceeds 2x background concentration in soil
BETA-BHC	SS	ND(1.8-2.2)	2.7-19	10.85	2/42	Exceeds 2x background concentration in soil
GAMMA-BHC(LINDANE)	SS	ND(1.8-2.2)	2.4-28	15.20	2/42	Exceeds 2x background concentration in soil
DELTA-BHC	SS	ND(1.8-2.2)	85	85	1/42	Exceeds 2x background concentration in soil
DIELDRIN	SS	0.61-12	2.6-950	148.34	21/42	Exceeds 2x background concentration in soil
4',4'-DDT(P,P-DDT)	SS	5.1-110	6.8-31011	3528	35/42	Exceeds 2x background concentration in soil
	SD	5.1-110	10-4000	730	6/9	Exceeds ER-L for sediment
4,4'-DDE(P,P'-DDE)	SS	1.9-29	3.7-9000	658.29	39/42	Exceeds 2x background concentration in soil
	SD	1.9-29	12-450	131	4/9	Exceeds ER-M for sediment.
4,4'-DDD(P,P'-DDD)	SS	ND(3.8-4.3)	62-12000	1658	23/42	Exceeds 2x background concentration in soil
	SD	ND(3.8-4.3)	8.8-560	101.73	8/9	Exceeds ER-M for sediment.

TABLE 6-6(continued)
CONTAMINANTS OF POTENTIAL ECOLOGICAL CONCERN
FCX WASHINGTON SITE
WASHINGTON, NORTH CAROLINA

PARAMETER	Media (1)	Control (2)	Range of Detects (3)	Average (4)	Frequency (5)	Rationale for Inclusion
ENDRIN	SS	ND(3.8-4.3)	1.2-5100	971.35	12/42	Exceeds 2x background concentration in soil
	SD	ND(3.8-4.3)	30-1100	565	2/9	Exceeds ER-M for sediment.
TOXAPHENE	SS	120	87-78000	18777	5/42	Exceeds 2x background concentration in soil
GAMMA-CHLORDANE	SS	ND(1.9-2.3)	9.3-1700	337.92	20/42	Exceeds 2x background concentration in soil
	SD	ND(1.9-2.3)	9.7-77	35.45	6/9	Exceeds ER-M for sediment.
ALPHA-CHLORDANE	SS	ND(l.6-2)	5.2-1500	238.92	24/42	Exceeds 2x background concentration in soil
	SD	ND(1.6-2)	9.8-34	18.93	3/9	Exceeds ER-M for sediment.
ENDRIN KETONE	SS	ND(3.7-4.3)	9.5-1100	264.25	10/42	Exceeds 2x background concentration in soil
BIS(2-ETHYLHEXYL)PHTHALATE	SS	ND(350-440)	410-160000	63953	4/42	Exceeds 2x background concentration in soil
BENZO(A)ANTHRACENE	SS	ND(350-440)	41-3500	999	12/42	Exceeds ER-M for sediment.
	SD	ND(350-440)	400-2100	1250	2/9	Exceeds 2x background concentration in soil
CHRYSENE	SS	ND(350-440)	37-5200	1064	16/42	Exceeds ER-L for sediment.
	SD	ND(350-440)	100-2200	914	5/9	Exceeds 2x background concentration in soil
BENZO(B &/OR K)FLUORANTHENE	SS	ND(350-440)	89-5500	1375	11/42	Exceeds 2x background concentration in soil
BENZO-A-PYRENE	SS	ND(350-440)	300-3700	1582	5/42	Exceeds 2x background concentration in soil
INDENO(1,2,3-CD)PYRENE	SS	ND(350-440)	410-1700	1055	2/42	Exceeds 2x background concentration in soil
DIBENZO(A,H)ANTHRACENE	SS	ND(350-440)	75-3500	1159	6/42	Exceeds 2x background concentration in soil
TEQ(TOXIC. EQUIV.VALUE. FROM I-TEF/89) (DIOXIN)	SS	NA	3.6-11	7.3	2/2	

1. SS is surface soil, SW is surface water, SD is sediment.
2. Control samples: Surface soil; SS-1, SS-2, SS-3, SS-4, SS-5,
   Sediment: Same as surface soils.
3. Surface soil were collected during March and April 1992. Surface water and sediment were collected during April 1992. Units are: ug/kg for organic soil samples, ug/l for organic water samples, mg/kg for inorganic soil samples, ug/l for inorganic water samples and ug/kg for dioxin congeners.
4. The value shown is the arithmetic mean of samples with detected contamination "hits".
5 The ratio is number of detected "hits" for the total number of sample locations (not counting control locations)
   Duplicate samples were considered as one "hit" based on the higher contaminant concentration.

COC Contaminant of Concern
ND Not detected above the minimum quantitation limit.
NA Not applicable

F. Conclusions

The assessment concluded that the total incremental lifetime cancer risk is within or below EPA's acceptable target range for all receptors in Source Areas 1-5, farmland, Mt. Pleasant Canal, wetlands, and Onsite Drainage Ditch. Unacceptable non-cancer effects are not expected for any human receptor in any of the areas evaluated.

The ecological assessment concluded that the chemicals present in soils, sediments, and surface waters have the potential to negatively impact terrestrial and aquatic organisms, however both benthic communities appear to be healthy in terms of diversity. Base on these conclusions, there is a need for further ecological evaluation at the Site. However, further ecological evaluation should be delayed until the recent removal action has had sufficient time to impact the environmental setting. Therefore further ecological evaluation will be delayed until the five year review.

VII. THE SELECTED REMEDY

Based upon consideration of the requirements of CERCLA, the NCP, and public and state comments, EPA has selected No further Action for the on-site soils. The risk associated with this Site has been calculated to be within the accepted risk range determined to be protective of human health and the environment. A five year review will be conducted which will include a thorough ecological assessment.

Appendix I
Responsiveness Summary

The Responsiveness Summary is the official record of how the Agency responded to public comments as a part of the decision making process. The responsiveness summary also provides the decision makers of the lead Agency with the public's views, so that they are considered in the final decision.

This document is segregated into three components; summary of the community's involvement, the Agency's response to comments received at the proposed plan public meeting and the Agency's response to written comments received form concern parties during the process.

Background of Community involvement and Concerns

The public concerns regarding this Site have been minimal. This is probably the result of the Agency's rather extensive community relations efforts, and the fact that the contaminated source and soils were removed by the time critical removal.

Several public meetings were held. The first meeting was held on October 3, 1991 to discuss the superfund process, the proposed plan meeting for OU1 was held on May 4, 1993, and the proposed plan public meeting for OU2 was held on August 29, 1996. Several fact sheets were prepared and distributed through out the process. The Administrative Record was made available to the public on August 22, 1996. Announcements of each meeting were advertised in the local newspaper and press releases prepared.

Public Meeting Comments

The community concerns that were expressed as a result of the August 29, 1996 proposed plan public meeting are as follows:

Comment: A representative of the Pamlico-Tar River Foundation ask how were we sure that all the contaminated soil on the site had been treated?

Response: The Agency conducted a risk assessment on the soils remaining in place to determine if they presented a problem, and the results revealed that the remaining soils posed no risk to human health.

Comment: What happen to the treated soils and what is the status of the groundwater.

Response: The treated soils, were given to the Department of Transportation. The groundwater remediation is a separate component is presently being designed and will be completed by the spring of 1997.

Comment: What is the time frame for the overall cleanup?

Response: We estimate thirty years as a rule for costing purposes, however we are uncertain how long the actual pump and treat will take.

Comment: Does the groundwater portion take into consideration the in situ complexity of the chemicals with natural soils in the area and what the ultimate permeation rate for the aquifer is?

Response: We set the remediation goals to be protective of groundwater. To do

that we take into consideration the coefficients and partitioning factors.

Comment: Are the existing soils below those levels considered to be harmful?

Response: Correct.

Comment: The concentrations remaining in those soils is extremely small and would be tied up in the soils and would never present a problem to groundwater.

Response: Correct.

Response to Written Comments

There were no written comments received during the comment period.